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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
CHANG, AUDREY Y	
ART UNIT	**PAPER NUMBER**
2872	

DATE MAILED: 10/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/650,940	ROH, JAE-WOO	
	Examiner	Art Unit	
	Audrey Y. Chang	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 August 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/23/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Remark

- This Office Action is in response to applicant's amendment filed on August 4, 2006, which has been entered into the file.
- By this amendment, the applicant has amended claims 1-3, 5, 7, and 8 and has canceled claim 11.
- Claims 1-10 remain pending in this application.

Response to Amendment

1. The amendment filed **August 4, 2006** is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows:

Claims 1, 7, and 8 have been amended to included the phrases "a lens for focusing an incident reference beam" and "focused incident reference beam" and **claim 1 has been amended** to include the phrase "incident reference beam being parallel-shifted by said incident reference beam providing means".

The specification only teaches that the lens (216) is used to "deflecting" the reference beam, (please see paragraph [0038]), not focusing the bean.

The specification **fails** to teach that the reference beams are "**parallel shifted**".

Claim 1 has been amended to include the phrase "the incident reference beam formed by said incident reference beam providing means is a plane wave" that is not supported by the specification. The incident reference beam providing means is mainly a diaphragm or iris that does not have the optical property for making the reference beam a plane wave.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. **Claims 1-10 are rejected under 35 U.S.C. 112, first paragraph**, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The reasons for rejections based on the newly added matters are set forth in the paragraphs above.

4. **Claims 1-10 are rejected under 35 U.S.C. 112, first paragraph**, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 1 has been amended to include the phrase "the incident reference beam formed by said incident reference beam providing means is a plane wave" that is not supported by the specification. The incident reference beam providing means is mainly a diaphragm or iris that does not have the optical property for making the reference beam a plane wave.

Claim Objections

5. Claims 1-10 are objected to because of the following informalities:

(1). **Claim 1 has been amended** to include the phrase "capable of angular-multiplexing" that is confusing and indefinite since it is not clear what does it mean by "capable of". What are the structure that "enable" this "angular multiplexing" capability?

(2). **Claim 1 has been amended** to include the "said incident reference beam being parallel-shifted" that is confusing and indefinite since it is not clear the parallel shift is measured with respect to what?

Appropriate correction is required.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-2, and 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent application publication by Goulanian et al (US 2005/0122549 A1) in view of the patents issued to Blaum et al (PN. 5,727,226).

Claim 1 has been significantly amended that necessitates the new grounds of rejections.

Goulanian et al teaches a *volume holographic data storage system* that is comprised of a *light source* (60, Figures 7 and 8) for generating a *laser beam*, a *beam splitter* (64) for splitting the laser beam into a *signal beam* (40) and a *reference beam* (74), a *spatial light modulator* (65) for modulating the *signal bean* into pixel data based on data inputted from the outside, a *beam selecting means* (83) or *incident reference beam providing means for* transmitting and forming an incident reference beam from a portion of the initial reference beam in a size smaller than the size of the initial reference beam to thereby

produce a *reduced reference beam*, a *lens* (such as 85 or 88) for *refracting* the reduced reference beam into a *storage medium* (50) and a *deflector* serves as the *reflecting means* (86) for reflecting the reduced reference beam received from the *incident reference beam providing means* toward an incident location on the lens (88, please see Figures 7 and 8). Goulanian et al teaches that the beam selecting means is a *two-dimensional diaphragm or iris* (83 or 67, paragraph [0195]) that is driven by an actuator (84) so that the *size* of the reference beam can be *changed* and the reference beam can be ***parallel shifted*** with respect to *itself* and the *axis of the lens* (88), (please see paragraph [0198]), this means the *incident locations* of the **reduced** reference beams formed by selecting different portions of the reference beam (74) on the lens (88) are *different from each other*. The reduced reference beams having different beam specifics, (such as beam size and parallel shifted position and incident angles and locations on the recording medium), are used to record *corresponding data,* prepared by the computer (48) and inputted into the spatial light modulator, that are used to modulate the signal beam, (please see paragraph [0198] to [0199]). It is implicitly true that the reference beams having different specifics, including different incident angle separation (i.e. *capable of angular-multiplexing*), would make the holographic recordings of different data represented by the signal beams *separated* from each other so that the cross talk between the recorded holographic data is reduced.

This reference has met all the limitations of the claims with the exception that it does not teach explicitly that the data intended to be recorded are *digital* data that are represented as binary pixel data on the spatial light modulator and it does not teach *explicitly* that the data being recorded are arranged in a *page-by-page format*. However **Goulanian** et al does teach that the data is inputted to the spatial light modulator and represented by the pixels of the spatial light modulator to modulate the signal beam which implicitly suggest that the data is represented one pixel-arrangement at a time, which is essentially of page-by-page format. **Blaum** et al in the same field of endeavor teaches a volume holographic storage system wherein *digital* data is intended to be recorded in angular multiplexing manner. Blaum et al

specifically teaches that digital data are represented by *a* spatial light modulator (30) that is controlled by a controller (50) for modulating the signal light beam to make the digital data capable to be recorded as holographic data. The digital data is represented as binary coding on a page-by-page basis to be imparted on the signal beam (please see the abstract). Blaum et al also teaches that the different reference beams with different incident angles and locations on the recording medium are used for recording different page of the data, (please see Figure 1). It would then have been obvious to one skilled in the art to apply the teachings of **Blaum** et al to modify the system of **Goulanian** et al to inputted digital data to the spatial light modulator to make it capable of recording digital data for the benefit of expanding the utility of the holographic storage system.

Claim 1 has been amended to include the feature that the incident reference beam is focused on a storage medium. Goulanian et al does not teach such explicitly. Blaum et al teaches explicitly that the multiplexer (40, Figure 2) for generating the incident reference beam to be focused on the storage medium, (10). It would then have been obvious to one skilled in the art to apply the teachings of Blaum et al to use optical means to provide focused incident reference beam on the storage medium for recording the hologram using focused reference beam as alternative way to recorded focused hologram.

With regard to claim 2, Goulanian et al teaches specifically that the beam selecting means is a two-dimensional diaphragm or iris (83 or 67, paragraph [0195]) that is driven by an actuator (84) so that the *size* of the reference beam can be *changed* and the reference beam can be *parallel shifted* with respect to *itself* and the *axis of the lens* (88). This means the two-dimensional iris is driven on a two-dimensional plane to provide the parallel shift therefore changing the incident location. **With regard to the amendment, Goulanian et al** teaches explicitly to use a reflector (86) for receiving the light from the iris to an incident location to the lens.

With regard to claims 7 and 8, the method for recording a holographic data is implicitly included by the system disclosure of Goulanian et al. Goulanian et al teaches that locations of the deflector or

reflecting means (86) may also be changed by the actuator (87) and the direction of the signal beam may also be changed by using a movable deflector (70) that is driven by an actuator (71, Figure 7). It is implicitly true that during the holographic recording process both the position of the deflector or reflecting means and therefore the incident positions of the reference beam onto the recording medium and the reduced reference beam generated by the selecting means are changed so that different interference patterns between the reduced reference beam and the signal beam can be recorded in a systematic fashion and the holograms or the interference patterns are recoded in a spatially and angularly multiplexed fashion. The order of changing the reflecting means and changing the reduced reference beam does not change the result to the holograms being recorded.

With regard to claim 9, Goulanian et al teaches that the beam selecting means is a two-dimensional diaphragm or iris which has *transparent center region* and *non-transparent periphery region.* Although this reference does not teach explicitly that transparent center region is of a circular shape however it is either implicitly included in the disclosure or an obvious modification to one skilled in the art to make the reduced reference beam with circular beam shape.

With regard to claim 10, Goulanian et al teaches the laser light source comprises a beam expander, (63, Figure 8).

8. Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent application publication by Goulanian et al and the patent issued to Blaum et al as applied to claim 2 above, and further in view of the patent issued to Hays et al (PN. 5,777,760).

The volume holographic memory system taught by **Goulanian** et al in combination with the teachings of **Blaum** et al as described for claims 1 and 2 above have met all the limitations of the claims.

With regard to claims 3-4, Goulanian et al teaches to use a two-dimensional deflector (86) serves as the reflecting means (86) that is driven by an actuator (87) to reflect the reduced reference beam to the

lens which serves as the second reflection mirror. This reference however does not teach explicitly to use an additional reflecting mirror (as the first mirror). But using reflecting mirror as means to redirect light beam is a common practice in the art. **Hays et al** (Figure 10) teaches an arrangement of using a first and second reflecting mirror (33 and 35) with an actuator (41) to control the position of the second mirror (33) to direct the reference beam toward the lens (37). It would then have been obvious to one skilled in the art to apply the teachings of **Hays** et al as an alternative arrangement for the hologram memory system for the benefit of have more direction control of the reference beam. It is an obvious modification to one skilled in the art to make the incident direction of the reference beam on the lens to be the same for the benefit of maintaining the incident direction of the reference beam on the recording medium. With regard to claim 6, although these references do not teach explicitly to have an actuator to control the position of the first mirror, such modifications would have been obvious to one skilled in the art for the benefit of adding add ional control to the direction of the reference beam.

9. Claims 1, 7, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Blaum et al (PN. 5,727,226) in view of the patent issued to Klug et al (PN. 6,330,088).

Blaum et al teaches a volume holographic digital storage system that is comprised of a *light generator* including a *laser light source* (20, Figure 2) for generating a laser beam, a *beam splitter* (24) for splitting the laser beam into a *signal beam* (28) and a *reference beam* (26), and a *spatial light modulator* (30) for modulating the signal beam to contain binary pixel data on a page-by-page basis based on the data inputted from the outside, (please see the binary page data as shown in Figures 8 and 9). Blaum et al further teaches that the storage system comprises a mirror for reflecting reference beam to a beam multiplexer (40) for conditioning the reference beam to incident on the recording medium (10) at different incident angle to interfere with the signal beam modulated with different page of the data to

provide angular multiplexing recording of the hologram wherein the angular multiplexing recording implicitly satisfies the angular sensitivity of the medium to reduce cross talk of the recording for different page of the data.

This reference has met all the limitations of the claims with the exception that it does not teach explicitly to *include an incident reference beam providing mean* and a *lens*. **Klug** et al in the same field of endeavor teaches a reference beam steering means (400, Figures 8 and 14) that is comprised of an *aperture* (430, Figure 14) for reducing the beam waist of the reference beam (25), a beam steering system (450) for receiving the reduced reference beam and a lens (410 or 405) having a plurality of incident locations (the incident locations are along the surface of the lens) inherently separated from each other that will refract the reduced reference beam at different refract angle toward the hologram recording medium (110). It would then have been obvious to one skilled in the art to apply the teachings of Klug et al to modify the multiplexer of Blaum et al for the benefit of providing beam size control and explicitly beam steering arrangement to steer the reference beam to the recording medium with more control.

Claim 1 has been amended to include the feature that the incident reference beam is *focused* on a storage medium. Blaum et al teaches explicitly that the multiplexer (40, Figure 2) for generating the incident reference beam to be focused on the storage medium, (10).

With regard to claim 7, Blaum et al in view of Klug et al teach that the hologram is recorded by moving the reflecting means to record different page data of the signal beam with the reference beam incident on the recording medium at different angle (i.e. angular multiplexing). The interference patterns between the reference and signal beams is the recorded hologram.

With regard to claim 10, Blaum et al teaches the light source generation means includes a laser light source (20) and a beam shaping means (22) that includes a beam expander, (please see column 5, lines 45-50).

12. **Claims 2-6 and 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over patents issued to Blaum et al and Klug et al as applied to claim 1 above, and further in view of the patent application publication by Goulanian et al (US 2005/0122549 A1).**

The volume holographic digital storage system taught by Blaum et al in view of the patent issued to Klug et al as described for claim 1 above have met all the limitations of the claims.

With regard to claim 2, these references however do not teach explicitly to use an actuator to move the location of the aperture. Goulanian et al in the same field of endeavor teaches to use abeam selecting means comprises a two-dimensional diaphragm or iris (83 or 67, paragraph [0195]) that is driven by an actuator (84) so that both the *size* and the location of the reference beam can be *changed* with respect to *itself* and the *axis of the lens* (88). Goulanian et al further teaches, **with respect to the amendment to claim 2**, to use a reflector (86) to receive the reference beam from the iris and to an incident location on the lens. It would then have been obvious to one skilled in the art to apply the teachings of Goulanian et al to use an actuator to drive the aperture so that the reference beam can be further steered by changing the location of the aperture. **With regard to claim 8,** the steering of the reference beam then is alternatively done by the movement of the aperture or iris for the recording of the hologram.

With regard to claims 3-6, Klug et al teaches that an actuator is used to adjust the position of the reflecting mirror (460, Figure 15) in the beam steering system (450). Although this reference does not teach to use a second reflecting mirror, however it is really a common practice in the art to use reflecting mirror to fold the light beam as desired to direct the light beam to desired location. The feature concerning another actuator is considered to be obvious modification to one skilled in the art since it is implicitly true that the orientation of the reflecting means needed to be adjusted and oriented properly to properly steer the reference beam to the desired location and to use hand or any other actuator means would have been obvious to one skilled in the art to achieve the proper orientation.

With regard to claim 9, the aperture in general has a circular transparent shape in the center.

Response to Arguments

10. Applicant's arguments filed on August 4, 2006 have been fully considered but they are not persuasive.

11. Applicant's arguments are mainly drawn to the newly amended features in the claims and they have been fully addressed in the paragraphs above. The applicant is respectfully noted that the subject matters that are not positively disclosed in the specifications cannot be relied upon to overcome the rejections and they are subjected to new matters rejections.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 571-272-2309. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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A. Chang, Ph.D.